Amendments to the Specification:

Please replace the abstract of the specification with the following rewritten abstract:

--A system for the plasma treatment of parts. The system includes a chamber base sealingly engageable with a reaction chamber to form a treatment chamber and a lifting device operable to lift the reaction chamber from the chamber base. A transfer mechanism is operable to transfer parts along a guide to multiple treatment positions within the treatment chamber when the reaction chamber is disengaged from the chamber base. An electronic control system controls the transfer mechanism for transferring the plurality of parts to the treatment positions. The parts are treated with a plasma produced within the treatment chamber by a plasma-generating device.--

Please replace the first paragraph of the specification with the following rewritten paragraph:

–This application is a continuation of U.S. Application No. 09/012,743, ~~which was~~ filed [[on]] January 23, 1998, now Patent No. 6,245,189, which is a continuation-in-part of U.S. Application No. 09/601,687, ~~which was~~ filed [[on]] February 15, 1996 (abandoned), which is a continuation-in-part of Application No. 567,797, filed December 5, 1995, now Patent No. 5,766,404, which is a continuation-in-part of Application No. 350,320, filed December 5, 1994 (abandoned).--

Please replace the paragraph beginning on page 4, line 3 with the following rewritten paragraph:

-- U.S. Pat. No. 4,889,609 to Cannella discloses an automated dry etching system which is titled "Continuous" but utilizes input and output belts which are enclosed in pressurized chambers which are maintained at a preselected partial vacuum. The enclosed nature of these chambers necessarily [[limit]] limits the number of parts that can be treated before the chambers have to be opened for loading a new batch to be processed. Additionally, the configuration of the input gate allows a very limited number of parts to be treated at once, and consequentially, the throughput of this system can be expected to be likewise limited. --

Please replace the paragraph beginning on page 6, line 6 with the following rewritten paragraph:

--It is [[a]] yet another object of the present invention to provide a DC bias to the electrodes in order to promote better penetration of plasma between parts. –

Please replace the paragraph beginning on page 9, line 13 with the following rewritten paragraph:

--A third preferred embodiment is a plasma treatment system for treating parts, which includes a reaction chamber, a device for supporting a number of parts in a multilevel array and a mechanism for generating a gas plasma and inducing a plasma reaction with the parts. The gas plasma mechanism ~~including~~ includes devices for applying Radio Frequency (RF) power and DC bias power to the gas plasma. This is

done by providing one or more electrodes through which RF is used to excite the gas to a plasma state, and the DC bias is also applied to one or more ~~electrodes~~ electrodes. This DC bias is used to direct the flow of the plasma, increase the ionic energy, and increase the ionization rate. By using vertically oriented electrodes, the plasma can be made to flow horizontally between the layers of a multilevel array that holds parts that are to be treated. The applied DC bias causes a more defined directionality of flow, which allows better penetration of the plasma to the multilevel array, and creates more uniformity of treatment. This improved penetration also allows closer spacing of parts and levels in a carrier, so that a carrier may have numerous levels configured into a "cassette" or "magazine". Use of ~~magazines~~ a magazine which [[carry]] carries a large number of parts [[allow]] allows increased throughput of parts, in either in-line, batch-processing or systems which use robotics. --

Please replace the paragraph beginning on page 12, line 15 with the following rewritten paragraph:

-- The preferred embodiment of the present invention is a plasma treatment system for increased throughput plasma treatment and cleaning of any of a variety of parts and components. The present invention can be used to increase efficiency and cut processing time in a number of different configurations, including in-line processing, batch processing, and processing which [[use]] uses robotics for material handling. The plasma treatment system of the preferred embodiment, although generally applicable to any substrate susceptible of plasma reaction, is directed toward use within the electronics industry, and more particularly toward assembly and packaging applications associated

therewith, and is set forth in Fig. 1, where it is designated therein by the general reference character **10**. --

Please replace the paragraph beginning on page 15, line 26 with the following rewritten paragraph:

-- The versatility and capabilities of the push mechanism **20** (and the associated linear drive assembly 22) are of key importance to the advantages offered by the plasma treatment system **10** and the efficiency obtained thereby. As shown in the close-up view of Fig. 4, and in the end view of Fig. 5, the push mechanism **20** includes a vertically disposed drive attachment portion **58**, a horizontally disposed, T-shaped arm member **60**, which is joined to the top of the drive attachment portion **58** at the base of the "T", and first and second catch assemblies **62** and **64**. The first and second catch assemblies (**62** and **64**) are located at each end of the cross portion of the "T" of the arm member **60** and include first and second catch actuators **66** and **68**, respectively. The first and second catch actuators (**66** and **68**) act to lower and raise attached first and second catch fingers **70** and **72**, which are horizontally disposed members having lengths that permit extension over the travel area of the PC board **28**. The catch actuators (**66** and **68**) are commercially available pneumatic devices having air cylinders and spring returns. First and second catch blocks **74** and **76**, present at the ends of the first and second catch fingers (**70** and **72**), respectively, and depending therefrom, permit abuttable engagement of the PC board **28** when the catch fingers (**70** or **72**) are in a lowered position. A first and second catch sesnsor **75** and **77**, whcih are of the infrared

variety, are also located at the ends of the first and second catch fingers (**70** and **72**), respectively, and provide for detection of the PC boards **28**. It will be apparent that a variety of configurations for the dispositions and shapes of the components as comprise the push mechanism **20** may be employed to achieve the "catching" and "pushing" ability of the push mechanism **20** (the operation of which will be described in more detail later herein). For example, the catch actuators (**66** and **68**) might be relocated from the arm member **60** to the ends of the catch fingers (**70** and **72**), with the catch fingers (**70** and **72**) then attached directly to the arm member **60** and the catch blocks (**74** and **76**) attached directly to the catch actuators (**66** and **68**), such that only the catch blocks (**74** and **76**) are raised and lowered, among many other possible configurations. The push mechanism **20** might also take the form of a "pull[["]] mechanism" where parts are processed which accommodate this or are held in a holder adapted to permit such. Therefore, the description of the push mechanism **20** as applies to the invention **10** is not intended to be limited to just the particular arrangement as has been set forth. --

Please replace the paragraph beginning on page 19, line 6 with the following rewritten paragraph:

-- As is shown in Fig. 3b, after the last PC board **28** has been loaded, the first catch finger **70** is raised and the push mechanism **20** is moved by the linear drive assembly **22** to a location outside of the perimeter of the chamber base **16**. At the same time, the conveyor position actuator **32** moves the conveyor **30** back out of the reaction chamber **14** area as well. The reaction chamber **14** is then lowered by the chamber lift

actuators **40** onto the chamber base **16**, whereon the reaction chamber **14** is vacuum-tightly fittable, and the plasma process is initiated. Referring again to Fig. 2, there is shown a vacuum and plasma generating system **27** having a number of elements of generally conventional nature. A vacuum port **90**, to which is connected a vacuum pump (not shown), provides that the reaction chamber **14** may be evacuated to a predetermined level, which is generally in the so-called "soft vacuum" region of 0.1-1.0 mm Hg. A gas distribution manifold **92** allows for the continuous introduction of process gas (e.g., oxygen and argon) within the reaction chamber **14**. Flexible Teflon® tubing (not shown) provides that the gas manifold **92** may be raised in conjunction with the reaction chamber **14**. A plasma is generated within the evacuated reaction chamber **14** with a radio frequency generator **94**, there being provided for this purpose four radio frequency ~~feedthroughes~~ feedthroughs **96** which are located in the chamber base **16**. An electrode **98** for the application of high voltage, to which the chamber guide rails **52** are clamped with guide rail clamps **100** (see FIG. 1) and conveniently supported thereby, provides that plasma reaction may then occur at the surface of the PC boards **28**. It will be apparent to those with ordinary skill in the art that other electrical and radio frequency configurations for the chamber guide rails **52** might be employed. Thus, the chamber guide rails **52** might be radio frequency powered, or grounded, or electrically "floating" (isolated), or some combination of the foregoing. Additionally, a DC bias circuit can be included in the plasma treatment system to increase the directionality of plasma flow and the energy level of the ions and electrons in the plasma. The higher energy level also increases the ionization rate, thus increasing the number of ions and electrons. The

increased energy level and increased ionization rate both act to produce a higher etching rate and thus a shorter processing time. The increased bias also results in a more directional flow of ions onto the parts, resulting in a more anisotropic etching which is required when etching holes and vias. Anisotropic etching provides straight wall etching which decreases undercutting. This DC bias circuit is discussed in more detail below (see FIG. 12). --

Please replace the paragraph beginning on page 20, line 16 with the following rewritten paragraph:

-- To reiterate, since the plasma treatment system **10** incorporates a method of transfer that provides that no moving parts are located within the reaction chamber **14** during plasma treatment, no moving parts are degraded, and no contaminants (from machine oils or lubricants) are introduced onto the treated PC boards **28**. When the plasma treatment is completed, nitrogen is introduced into the reaction chamber **14** to bring the pressure of the reaction chamber **14** up to atmospheric level, and the reaction chamber **14** is again lifted up and out of the way via the chamber lift actuators **40**. Referring again to Figs. 1 and 2, and also to Fig. 3c, the output assembly **24** is comprised of components ~~essential~~ essentially identical to the conveyor input assembly **12**, but without a conveyor-belt type capability, and provides an analogously reverse function thereto. Thus, a position actuator **102** moves an output carrier **104**, which is mounted thereon, into close proximity to the unload end **56** of the chamber guide rails **52**. The second catch sensor **77** present on the push mechanism **20** locates the first

PC board **28**, whereupon the second catch actuator **68** lowers the second catch finger and block (**72** and **76**) in order that the first PC board **28** may be pushed along the chamber guide rails **52** and unloaded onto an adjustable pair of output carrier guide rails **106**. The output carrier **104** is then moved by the position actuator **102** (along an associated position actuator guide **108** as before) away from the reaction chamber **14** so that transfer of the PC board **28** (by the push mechanism **20**) to the next station may occur. The remaining PC board(s) **28'** is moved onto the output carrier **104** by the push mechanism **20** in similar fashion. Prior to the re-lowering of the reaction chamber **14**, and while the unloading of the treated PC boards **28** is occurring, untreated PC boards **28** are again loaded into the reaction chamber **14** for plasma treatment following the steps outlined above. In addition to the aforementioned advantages, the plasma treatment system **10** of the present invention provides that parts may be treated by plasma reaction without ever having to remove them from the assembly line, thereby reducing overall process time. --

Please replace the paragraph beginning on page 21, line 24 with the following rewritten paragraph:

-- Shown in the front view of Fig. 6 is an alternative embodiment of the present invention, in which there is provided a means by which an even greater number of PC boards or other parts may be subjected to simultaneous plasma treatment. The alternative embodiment employs components very similar to the aforementioned embodiment, but so modified as to achieve a multi-level loading of PC boards within the

PAGE 10/25 * RCVD AT 4/7/2004 2:17:36 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/5 * DNIS:8729306 * CSID:513 241 6234 * DURATION (mm-ss):08-04

reaction chamber and thereby making possible a multiplicatively increased throughput of PC boards or other parts. The alternative embodiment is designated as **410** in the drawings, and to the extent those elements of the alternative embodiment **410** are substantially identical (or closely correlate) to those previously appearing in the single-level embodiment **10**, they will be referred to by a reference number incorporating the original reference number prefaced with the digit "**4**". New elements which appear will be numbered in continuous fashion from previously numbered elements of the single-level embodiment **10**, beginning with the number "**110**". Referring now to both Fig. 6 and the top plan view of Fig. 7, a stationary conveyor **430** is essentially identical to the conveyor **30** of the signle-level embodiment **10**, having a pair of adjustable conveyor guide rails **434** for receiving a PC board **28** from, e.g., a previous conveyor (not shown), but does not move upon a conveyor position actuator (**32**). An input carrier **110** does move along a first horizontal position actuator **432** in similar fashion to the previous conveyor and output carrier (**30** and **104**) and, in addition, is provided with a first vertical position actuator **112** and two pairs of adjustable upper and lower input guide rails **114** and **116** [[in]] arrayed in bi-level fashion. The first vertical position actuator **112** acts to raise and lower the input carrier **110** such that when the input carrier **110** is in the lowered position the upper input guide rails **114** thereon are in co-planar and co-linear alignment with the conveyor guide rails **434**. Alternatively, when the input carrier **110** is in the raised position, the lower input guide rails **116** are made to be in alignment with the conveyor guide rails **434**. The vertical position actuator **112** is a commercially available pneumatic device, as before.--

Please replace the paragraph beginning on page 23, line 11 with the following rewritten paragraph:

As shown in FIG. 8, the multi-level embodiment **410** incorporates a linear drive assembly **422** as before, but a push mechanism **420** now includes first and second catch assemblies **462** and **464** having first and second catch actuators **466** and **468** which are attached not only to first and second lower catch fingers **470** and **472** (not shown) but to first and second upper catch fingers **124** and **126** (see FIG. 7) as well. The lengths of the catch fingers (**470**, **472**, **124**, and **126**) are again such as to extend over the travel areas of the PC boards **28**. In operation, and referring now to FIGS. 6 and 9a, and also to the end view of FIG. 10, a first catch sensor **475** present on the push mechanism **420** locates the PC board **28** as before. The first catch actuator **466** then lowers the first lower catch finger **470** such that a first catch block **474** may abut and push the PC board **28** when the linear drive assembly **422** is activated. The push mechanism **420** moves the PC board **28** onto the upper input guide rails **114** of the input carrier **110**. The first vertical position actuator **112** then raises the input carrier **110** so that a second PC board **28'** may be pushed onto the lower input guide rails **116**. During the transfer, the upper catch fingers (**124** and **126**) are maintained in a raised state so that catch blocks **128** and **130** thereon do not [[to]] interfere with the first PC board 28 present on the upper guide rails **114**. In addition, it will be noted that the two levels of the input carrier **110** are spaceably held apart by spacer members **132** which are located at one side of the input carrier **110** only, whereby the spacer members **132** do not interfere with the travel of the lower catch fingers (**470** and **472**) between the two levels. (The upper

and lower chamber guide rails (**118** and **452**) are similarly arranged.) --

Please replace the paragraph beginning on page 25, line 2 with the following rewritten paragraph:

-- The second level of the multi-level embodiment **410** doubles the number of parts that may be treated at one time. It is apparent, of course, that additional third and fourth levels, or more, could be added to further increase the throughput of parts. In addition, the different levels need not be [[in]] arranged in stacked alignment as shown, but rather might be staggered to achieve a close packing to the limit permitted by the need for a uniform plasma reaction. (A third position actuator that provides movement in a direction perpendicular to the horizontal position actuator **432** could be incorporated into the input and output carriers (**110** and **122**) in order to facilitate this. Similarly, the push mechanism **420** could incorporate additional actuators to provide for a retractable horizontal extension of the catch fingers (**470** and **472**) over more than one travel area. Such a system could be adapted for the single-level embodiment **10**, as well.) --